

## REMARKS

In complete response to the outstanding Official Action of November 13, 2008, on the above-identified application, reconsideration is respectfully requested. Claims 27 and 29 - 45 remain in this application.

### Claim Rejections Under 35 U.S.C. § 103

Claims 27, and 29 - 45 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nataraj '472. Applicant respectfully submits that claims 27, and 29 - 45 are not unpatentable over Nataraj '472.

The Examiner notes that Nataraj does not teach the temperature range of between 871° and 1300° C for the oxidizing mixture prior to the reforming step. The Examiner then notes that "Nataraj discloses heating oxygen-containing gases by direct combustion with a fuel gas" and that this temperature falls within the range. Applicants would like to respectfully point out that explicitly points out that:

"Heated oxidant **41** and heated partially reformed intermediate gas **25** are introduced into respective oxidant and reactant inlets to mixed conducting membrane reactor **43**. Heated oxidant **41** is at a temperature preferably within  $\pm 200^{\circ}$  F of the temperature of heated partially reformed intermediate gas **25** at the inlet to mixed conducting membrane reactor **43**. The gas temperature at the reactant inlet is in the range of about 1100 to 1400° F. (594 to 760° C)." *(column 12, lines 53 – 60)*

Hence, according to the teaching of Nataraj, the heated oxidant stream 41 should be no hotter than 871° C (i.e. 760° C + 111° C), and hence neither teaches nor suggests the 1000° C temperature required by claim 27 as currently amended.

As discussed above, Nataraj '472 fails to teach or suggest all the features present in claim 27 as currently amended, upon which claims 28 – 40 and 42 - 45 are dependent. Hence this rejection, as pertains to claim 27, and claims 28 – 40 and 42 - 45 which are dependent upon claim 27, is moot and should be withdrawn. Claims 46 and 47 have been cancelled, thereby rendering this rejection moot as pertains to these claims.

In the Response to Arguments, the Examiner finds the Applicant's previous responses, which are essentially repeated above, to be unpersuasive for three reasons. Applicants respectfully disagree with the Examiner on all three of these justifications, as explained in the following.

- First, the Examiner notes that the clause "about 1000° C" in claim 27 is a broad limitation and can include the temperature suggested by Nataraj.

Applicants respectfully point out that the term 'about' as used to modify a number or range in a claim, as discussed by the Federal Circuit, may be interpreted to encompass the range of experimental error that occurs in any measurement" (*BJ Services Co. v Halliburton Energy Services*, 338 F.3d 1368 (Fed. Cir. 2003)). While this particular possible measurement error was not discussed in the instant specification, one skilled in the art of syngas production and plant design would recognize that temperature sensors of this type typically have an accuracy of greater than +2.5%, with high quality sensors such as optical pyrometers often exceeding  $\pm 0.5\%$  in accuracy. As discussed below, it is clearly disclosed in Nataraj that the maximum reactor inlet temperature (and hence the maximum oxidant temperature) that is suitable for the disclosed mixed conducting membrane reactor design is 760 C. In order for a temperature of 760 C to be "about 1000 C", the insinuated instrument error would have to be on the order of  $\pm 25\%$ , which one skilled in the art would clearly recognize as excessive and unrealistic. Applicants respectfully argue that 760 C is not "about 1000 C".

- Second, the Examiner notes that "Nataraj does not teach that 760 C  $\pm$  200 F is the only inlet temperature that is a preferable temperature in the method and does not exclude the use of higher temperatures." The Examiner further notes that "Nataraj only discloses that this is the temperature of the oxidant at the inlet to the reactor but this does not preclude that the oxidant could be heated to a higher temperature prior to being at the preferable inlet temperature."

Applicants respectfully point out that Nataraj does not "teach that 760 C  $\pm$  200 F" is the inlet temperature at all. Nataraj teaches that 760 C is the *maximum* inlet temperature for this particular design of mixed conducting membrane reactor. It is very clearly stated in Nataraj that:

"the combined stream **21** can be further heated if necessary in heat exchanger **23** in heat exchange zone **8** to yield heated partially reformed intermediate gas **25** at 1100 to 1400 F (594 to 760 C)." (*column 12, lines 5 – 8*).

This temperature cannot be increased, per this particular disclosed process, since the:

"partially reformed intermediate gas **17** (*presumably intended to be stream 25*) is typically within a 50 F temperature approach to reforming and shift-equilibrium." (*column 12, lines 8 – 10*).

Also, it is clearly stated that:

"Heated oxidant **41** and heated partially reformed intermediate gas **25** are introduced into respective oxidant and reactant inlets to mixed conducting membrane reactor **43**. Heated oxidant **41** is at a temperature preferably within  $\pm 200$  F of the temperature of the heated partially reformed intermediate gas **25** at the inlet to mixed conducting membrane reactor **43**. The gas temperature at the reactant inlet is in the range of about 1100 to 1400 F (594 to 760 C)."

Hence, the skilled artisan reading Nataraj would recognize that the maximum temperature of *either gas* entering the membrane reactor is limited to 1400 F (760C) and thus the oxidant cannot be higher. One skilled in the art would recognize that the intent of this disclosure is that the oxidant be cooler than the *partially reformed* intermediate gas, and be within 200 F cooler not hotter, otherwise the inlet gas temperature would exceed that specified. The skilled artisan would also recognize that there would be no incentive to heat the oxidant stream to a higher temperature, then cool it down in order to not exceed the 760 C maximum reactor inlet temperature. This is neither taught nor suggested in Nataraj.

## CONCLUSION

In view of the current amendments, the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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